USPTO

STIC Search Report
EIC 3700

STIC Database Tracking Number: 112867

TO: David Bryant
Location: cp2 5d09
Art Unit: 3726
Wednesday, January 28, 2004

Case Serial Number:

From: Terry Solomon
Location: EIC 3700
CP2-2C08
Phone: 305-5932

Terrance.solomon@uspto.gov

Search Notes

David,

As I stated yesterday, the older German references pre-dated online databases to determine a patent-family. I was able to pull-up the record for DE 4109407, which yielded no English-language equivalents—it did have an abstract.

If you require a translation of these references, you can **copy and paste** the following link: http://ptoweb/patents/stic/stic-requesttranslation.htm to request a translation. You'll have to send one request per patent. Once the translators receive the email, they'll make copies of the patents you requested.

If you have any questions, give me a call at the number listed above, or send me e-mail.

10/069,838

sira
Search and Information Resources Administration

10709909
Basic Patent (No,Kind,Date): DE 4109407 A1 920924 <No. of Patents: 002>

PATENT FAMILY:
GERMANY (DE)
Patent (No,Kind,Date): DE 4109407 A1 920924
VORRICHTUNG ZUM PRAEZISIONSSCHMIEDEN AUF EINFACHWIRKENDEN UMFORMMASCHINEN (German)
Patent Assignee: LANGSCHWAGER INGO (DE)
Author (Inventor): LANGSCHWAGER INGO (DE)
Priority (No,Kind,Date): DE 4109407 A 910322
Applic (No,Kind,Date): DE 4109407 A 910322
IPC: * B21J-005/02; B21J-005/12; B21J-009/02; B21J-013/02; B21K-001/30
Derwent WPI Acc No: ; G 92-324666
Language of Document: German
Patent (No,Kind,Date): DE 4109407 C2 941027
VORRICHTUNG ZUM PRAEZISIONSSCHMIEDEN AUF EINFACHWIRKENDEN UMFORMMASCHINEN (German)
Patent Assignee: LANGSCHWAGER INGO (DE)
Author (Inventor): LANGSCHWAGER INGO (DE)
Priority (No,Kind,Date): DE 4109407 A 910322
Applic (No,Kind,Date): DE 4109407 A 910322
Filing Details: DE C2 D2 Grant of a patent after examination process
IPC: * B21J-005/02; B21J-005/12; B21J-009/02; B21J-013/02; B21K-001/30
Derwent WPI Acc No: * G 92-324666
Language of Document: German

1/5/2 (Item 1 from file: 351)

009197234
WPI Acc No: 1992-324666/**199240**
XRPX Acc No: N92-248152
Precision forging press with hydraulically actuated tool - forges workpiece in single stroke of press
Patent Assignee: LANGSCHWAGER I (LANG-I)
Inventor: LANGSCHWAGER I
Number of Countries: 001 Number of Patents: 002
Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Week	
DE 4109407	A	19920924	DE 4109407	A	19910322	199240	B
DE 4109407	C2	19941027	DE 4109407	A	19910322	199441	

Priority Applications (No Type Date): DE 4109407 A 19910322
Patent Details:

Patent No	Kind	Lan	Pg	Main IPC	Filing Notes
DE 4109407	A		8	B21J-005/02	
DE 4109407	C2		7	B21J-005/02	

Abstract (Basic): DE 4109407 A
A precision forging press is provided with hydraulically actuated tools which enable the forgings to be formed by a single working stroke of the press. The forging die is made in two parts (26a,26b) which are mounted between the lower end of the press ram (27) and the piston (2) of the tool (1).
As the ram (27) moves downwards it presses the piston (2) downwards against the spring (25). At the same time the piston drives

hydraulic fluid (8) into a chamber (9) underneath a second piston (5) attached to the lower end of a punch (4). The hydraulic pressure drives the punch upwards into the die (26a,26b) to forge the workpiece to the required shape.

USE/ADVANTAGE - Precision forging by a single stroke of the forging press.

Dwg. 1/4

PTO 04-1682

CY=DE DATE=19920924 KIND=A1
PN=4 109 407

PROCESS FOR PRECISION-SMITHING ON SINGLE-ACTION METAL-FORMING MACHINES
[Vorrichtung zum Präzisionsschmieden auf einfachwirkenden Umformmaschinen]

Ingo Langschwager

UNITED STATES PATENT AND TRADEMARK OFFICE
Washington, D.C. February 2004

Translated by: FLS, Inc.

PUBLICATION COUNTRY	(19)	: DE
DOCUMENT NUMBER	(11)	: 4109407
DOCUMENT KIND	(12)	: A1
	(13)	: PUBLISHED APPLICATION
PUBLICATION DATE	(43)	: 19920924
PUBLICATION DATE	(45)	:
APPLICATION NUMBER	(21)	: P4109407.7
APPLICATION DATE:	(22)	: 19910322
ADDITION TO	(61)	:
INTERNATIONAL CLASSIFICATION	(51)	: B21J 5/02; B21J 5/12; B21J 9/02; B21J 13/02; B21K 1/30
DOMESTIC CLASSIFICATION	(52)	:
PRIORITY COUNTRY	(33)	:
PRIORITY NUMBER	(31)	:
PRIORITY DATE	(32)	:
INVENTOR	(72)	: SAME AS APPLICANT
APPLICANT	(71)	: LANGSCHWAGER, INGO
TITLE:	(54)	: PROCESS FOR PRECISION-SMITHING ON SINGLE-ACTION METAL-FORMING MACHINES
FOREIGN TITLE	[54A]	: VORRICHTUNG ZUM PRÄZISIONSSCHMIEDEN AUF EINFACHWIRKENDEN UMFORMMASCHINEN

Description /1*

The invention relates to a device for precision-smithing on single-action metal-forming machines in accordance with the preamble of Claim 1.

The production of toothed wheels, particularly, bevel wheels, as they are used in differential gears of motor vehicles, by precision-smithing is familiar to the art. The advantages of precision-smithing compared to the production by conventional machining are a quicker production time and improved stability with equal tolerances. The actual precision-smithing process is carried out as follows: the preheated tubular piece is placed into a female mold half. The female mold is closed, whereas no deformation takes place yet. The deformation is carried out by means of a molding plug which enters the female mold cavity through a channel in the female mold until the cavity is completely filled out. During the deformation, two kinds of forces must be provided by the metal-forming machine. The molding plug's force, i.e., the actual deformation force, and the force which closes the female mold, which guarantees that the female mold will not open as a result of the internal pressure that is generated during the deformation process, which would lead to the formation of a spue, and, hence, to factory rejects. For this reason, precision-smithing processes like the above-described one have previously only been carried out on dual-action metal-forming machined. These are dual-action hydraulic or eccentric presses.

---

* Number in the margin indicates column in the foreign text.

Both machines are more expensive than the corresponding single-action variants. Moreover, neither of these two machines is optimally suited to carry out the precision-smithing process in mass production, such as, e.g., in the production of beveled differential gears for cars. The reasons for this will be explained in the following text.

In the hydraulic press, the forces are generated through the pressure of a hydraulic fluid on the appropriate piston. A large hydraulic piston ensures the closing force of the female mold halves whereas a smaller one generates the molding plug's force which is required for the deformation. The pressure is generated by a compressor. The advantage of this force-powered machine is that the arising forces can be kept constant, which leads to consistent smithing results. The disadvantage is that, at a constant compressor output, the conveyed volume flow becomes less and less as the pressure increases, which means that the forward-feeding speed is progressively reduced. This results in a slow deformation and in a correspondingly great pressure contact time. A long pressure contact period increases the wear and tear of the female mold, whereby its service life is shortened.

Eccentric presses work more rapidly than hydraulic presses. Their disadvantage with regard to the use of the precision-smithing technique is that the stroke of the molding plug is firmly predefined by the eccentricity of the machine which is due to the way in which it is engineered. This is briefly explained in the following manner: for reasons related to the production technique, it is not possible to produce blank pieces of an exactly equal volume. However, because on the one hand,

the female mold must remain shut at all times and also does not possess any compensatory spaces (which would lead to the formation of spues) and, on the other hand, the molding plug must be pushed forward so far that the cavity is completely filled out, the result is that the molding plug must variably fit the blank pieces with their great variety of /2
volumes. This requirement also applies to changes in the length of the metal-forming machine due to heat expansion. Naturally, with appropriate engineering, the elastic deformability of the molding plug (or of the entire metal-forming machine) could be utilized to vary the stroke of the molding plug. However, in no case could the forces involved in the deformation be kept constant.

Therefore, the invention is based on the objective of configuring a device of the kind previously described in such a way that the precision-smithing process can be used on nearly any metal-forming machine, whereas, for mass production purposes, on the one hand, a deformation speed that is as great as possible is to be attainable and, on the other hand, an exact adjustment option of the maximum arising forces is to be provided.

This objective is realized through the configuration in accordance with the characterizing portion of Patent Claim 1.

The inventive device is primarily comprised of two longitudinally displaceable hydraulic pistons and a housing of the device in which both pistons are located. The pistons are sized differently. The smaller piston - the molding plug piston - is connected with the molding plug, which is guided out of the device through a channel in the larger piston

- the tool piston. The molding plug piston is smaller than the tool piston because the deformation force is less than the force closing the tool. The bottom side of the two pistons is connected with a hydraulic fluid. The fluid volume under the tool piston is connected with the fluid volume under the molding plug's piston.

To use the device, it is installed on the machine table of a single-action metal-forming machine in such a way that the molding plug points upwards. The female mold is mounted on the tool piston in such a way that the molding plug, which projects beyond the piston's surface, projects into the channel that is located in one of the two female mold halves (bottom female mold). During the deformation process, the molding plug of the metal-forming machine presses the female mold, and, hence, the tool piston, downward. In this process, the tool piston displaces hydraulic fluid. The fluid flows under the molding plug's piston and causes the piston, and, thus, also the molding plug, to rise. Because the volume flows under the tool's piston and under the molding plug's piston are of equal magnitude, while, however, the surface of the molding plug's piston is greater than that of the tool piston, the absolute molding plug speed is greater than the absolute tool piston speed, which is identical to the speed of the molding plug. The deformation force opposes the penetration of the molding plug into the hollow cavity of the female mold, and, hence, it opposes the actual deformation. Thus, a pressure builds under the molding plug's piston that is so great at any time that the molding plug can generate the required deformation force. Because the fluid under the molding plug is in a connection with that under the tool's piston,

this pressure simultaneously also acts upon the tool piston's surface. Thus, the molding plug's force and the tool's closing force increase simultaneously and proportionally to the required deformation force. The ratio of the molding plug's force to the tool's closing force is only determined by the geometric surface ratio of the two pistons, and, hence, it is constant. /3

Two options of the positioning of the molding plug's piston are specified in Patent Claims 2 and 3. If, in accordance with Claim 2, the molding plug is carried inside the housing of the device, the absolute tool piston speed and the absolute molding plug piston speed add up to a relative speed of the molding plug to the female mold. If, in accordance with Claim 3, the molding plug piston is carried inside the tool's piston, the relative speed of the molding plug to the female mold results from the difference of the molding plug speed and the tool piston speed. However, because the molding plug piston speed is greater than the tool piston speed, the penetration speed of the molding plug into the female mold with this positioning of the molding plug piston is also greater than the absolute molding plug speed, which, after all, is identical to the speed of the tool piston. Thus, the positioning of the molding plug piston in the housing of the device results in the greatest possible deformation speed.

Additional advantageous configurations of the inventive device are provided in Patent Claims 4 to 7. The sequence of a deformation process shall be explained more closely by taking into consideration the doctrines in accordance with Patent Claims 4, 5, 6, and 7. The press plunger presses

the tool piston further and further downwards via the female mold, whereas the molding plug rises further and further, and the molding plug penetrates into the cavity of the female mold further and further. The force required for the deformation increases along with the distance that the molding plug penetrates into the female mold cavity, and which is a measurement for the degree of the deformation. The fluid pressure in the device increases proportionately to the deformation force in this process. The rise in pressure continues until the nominal pressure set at the pressure relief valves is reached. The valves then open and release hydraulic fluid from the device into a storage tank. A further downward movement of the tool's piston then does not result in any further increase in pressure. The deformation process is completed then and the pistons are put back into their original position. This occurs by means of appropriate resetting mechanisms. In this process, the loss of fluid which occurs by opening the pressure relief valves is compensated via a connection to the storage tank. The connection is secured against the intake of fluid during the working stroke by means of a check valve.

In summary, the advantages of precision-smithing with the inventive device in comparison with the production employing dual-action machines, are the following:

- applicability to almost any single-action metal-forming machines (flexibility, cost savings).
- High deformation speed (cost savings).
- The arising forces can be precisely adjusted (consistent smithing results).

- Added to this is that the hydraulic fluid is released in the unloaded state, which makes the device easier to maintain.

In the following text, the invention will be explained more closely by means of the drawings.

Shown are:

Figure 1, the basic structure of a device for precision- /4
smithing on a single-action metal-forming machine.

Figures 2 and 3, the device in accordance with Fig. 1 with a molding plug carried inside the housing of the device, and,

Figure 4, a device in accordance with Fig. 1, with a molding plug which is carried inside the tool's piston.

Identical components are marked with identical reference symbols in the Figures of the drawings.

Figure 1 depicts a precision-smithing device which is mounted on the machine table of a single-action metal-forming machine with the female mold (26a, 26b). The female mold (26a, 26b) is located on a tool piston (2). During the deformation, a press plunger (27) presses the molding cavity and the tool's piston (2) downwards. The tool's piston (2) presses hydraulic fluid under a molding plug piston (5). A molding plug (3) rises upwards. The molding plug speed relative to the molding cavity is greater than the press plunger speed. The speeds of the molding cavity and the molding plug are opposed. The fluid pressure in the device rises in proportion to the deformation force. Pressure relief valves (11) define the maximum pressure. The device operates more quickly than the metal-forming machine and facilitates consistent smithing results because

the maximum forces remain constant. The tool piston (2) and the molding plug piston are moved back into their original position by means of appropriate resetting mechanisms (24, 25). The other components of the device will be described in the following text by means of the additional figures.

Figure 2 depicts a device for precision-smithing in which a tool piston (2) is displaceably carried inside the housing (1) of the device. A molding plug (3) is connected with a molding plug piston (5) via a connecting rod (4). Molding plug piston (5), connecting rod (4), molding plug (3), and tool piston (2) are arranged centrally in relation to one another, i.e., that their central axes are identical. The molding plug piston (5) is carried displaceably in a cylindrical cavity (6) that is located below the tool piston (2) and separated from the work space (8) of the tool piston (2) by a plate (7) of the housing. The molding plug (3) is guided out of the device in upward direction by means of the connecting rod (4). In this process, the connecting rod (4) penetrates through the plate (7) of the housing and projects into a channel in the tool piston (2). The tip of the molding plug (3) is located above the upper half of the tool piston's surface. A work space (8) under the tool piston is connected with a work space (9) under the molding plug by means of bores (10). The work spaces (8 and 9), as well as the connecting bores (10), are filled with hydraulic fluid. To configure the stream's cross-section large, as many connecting bores as possible should be present. When the nominal pressure is reached during the working stroke, a pressure relief valve (11) opens and releases hydraulic fluid from the

work space (8) via a delivery line (12) into a storage tank (13). The subsequent flow of the fluid volume from the storage tank (13) into the work space (8) occurs via a delivery line (14) when the pistons are reset, whereas a check valve (15) opens. In this example, screw springs are used as resetting mechanisms. A screw spring (16) serves to reset the molding plug (5). It is located in the cylindrical cavity (6) and is propped against the top side of the molding plug (5) and the bottom /5
side of the plate of the housing (7). The cylindrical hollow cavity (6) is connected with its surroundings via connecting channels (17). The channels facilitate air volume compensation in the cavity (6). The resetting of the tool piston (2) occurs with the assistance of a screw spring (18) that is located in the work space (8) and is propped against the bottom side of the tool piston (2) and the top side of the plate (7) of the housing.

The resetting speed can be influenced by means of throttle check valves which can be built into the connecting bores (10). It is useful then to install the valves in such a way that they are opened completely during the working stroke and only oppose the fluid stream with little resistance. If the fluid flows in the opposite direction during the resetting process, the valves close down to a small cross-section.

A pressure builds which opposes the resetting.

Figure 3 depicts a variant of the device in which the piston arrangement is the same as in the device from Fig. 2. However, the resetting mechanism for the molding plug no longer is a mechanical spring, but a hydraulic resetting mechanism in which the pressure of a gas located inside

a pressure reservoir (22) is transmitted to a fluid which is connected with a surface of the top side of the molding plug (5). In Fig. 3, the surface supplied with pressure is bordered by a cylinder (19) which is located between the molding plug (5) and the connecting rod (4), and the diameter of which is smaller than that of the molding plug piston. The surface that is supplied with pressure is connected with a fluid volume (20) which, in turn, is connected with the pressure reservoir (22) via a conduit (21).

Figure 4 shows a variant of the device with the molding plug piston (5) carried inside the tool piston (2). The differences to the above-described variant will be represented briefly. The entire molding plug unit consisting of a molding plug (3), connecting rod (4), and molding plug piston (5) including the cylindrical cavity (6), and the molding plug resetting spring (16) is located within the tool piston (2). Here, instead of the connecting bores (10) of the variant described above, a central bore (7) in the bottom of the tool piston expediently takes its place, the diameter of which can be as large as that of the molding plug piston (5). If throttle check valves are to be used here to influence the resetting process, several small bores must replace the large bore (10), which benefits the flow, into which the valves can be built.

As an alternative to what is represented, the storage tank (13), the pressure relief valve (11), and the check valve (15), as well as the conduits (12 and 14), can be accommodated within the housing (1) of the device.

Moreover, it is possible to prestress the hydraulic fluid, e.g., by using a pressure reservoir, instead of the storage tank (13). A resetting mechanism for the tool piston can then be eliminated.

Patent Claims

1. Device for precision-smithing on single-action metal-forming machines exhibiting a press plunger, with a molding plug carrying out the deformation which penetrates on one side into a cavity of a female mold, characterized by a tool piston (2) which is actuated by the press plunger (27) on the one side of which the female mold (26a, 26b) is provided, and the other side of which is connected with a fluid volume (8), and a molding plug pinion (5) which is actively connected with the molding plug (3), which is connected with a fluid volume (9) that is connected to the fluid volume (8). /6

2. Device in accordance with Claim 1, characterized in that the molding plug's piston (5) is guided inside the housing of the device (1).

3. Device in accordance with Claim 1, characterized in that the molding plug's piston (5) is guided inside the tool's piston (2).

4. Device in accordance with Claim 1, characterized in that the tool's piston (2) and the molding plug's piston can be supplied by resetting mechanisms (24, 25), which move the pistons (2, 5) back into their original position after the deformation process has been completed.

5. Device in accordance with Claim 4, characterized in that the resetting mechanisms are mechanical springs or fluid springs or gas springs which are installed within the device.

6. Device in accordance with Claim 5, characterized in that the gas springs operate with external pressure reservoirs and a fluid as a pressure-transmitting medium.

7. Device in accordance with Claim 5, characterized in that the resetting mechanisms operate with compressors.

8. Device in accordance with Claim 1, characterized in that, to exactly adjust the forces occurring during the deformation process, the maximum possible pressure of the hydraulic fluid is determined by pressure relief valves (11) which release a specific amount of fluid into a storage reservoir (13) during each working stroke.

9. Device in accordance with Claim 8, characterized in that additional fluid volume released from the fluid volume spaces (work spaces) by opening the pressure relief valves (11) is sucked up via a connection (14) with the storage tank (13), which is secured against the intake of fluid by means of check valves (15).

Accompanied by 4 page(s) of drawings.

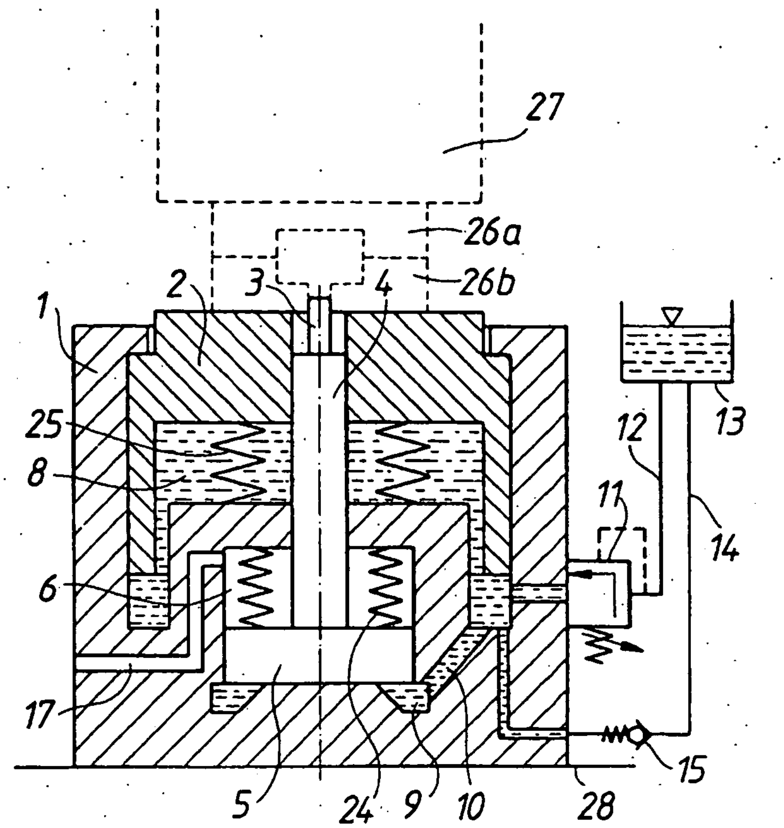


Fig.1

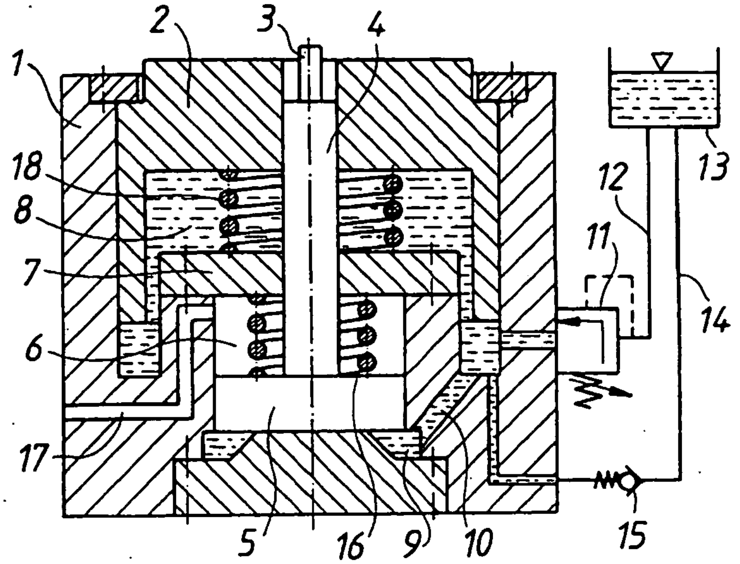


Fig. 2

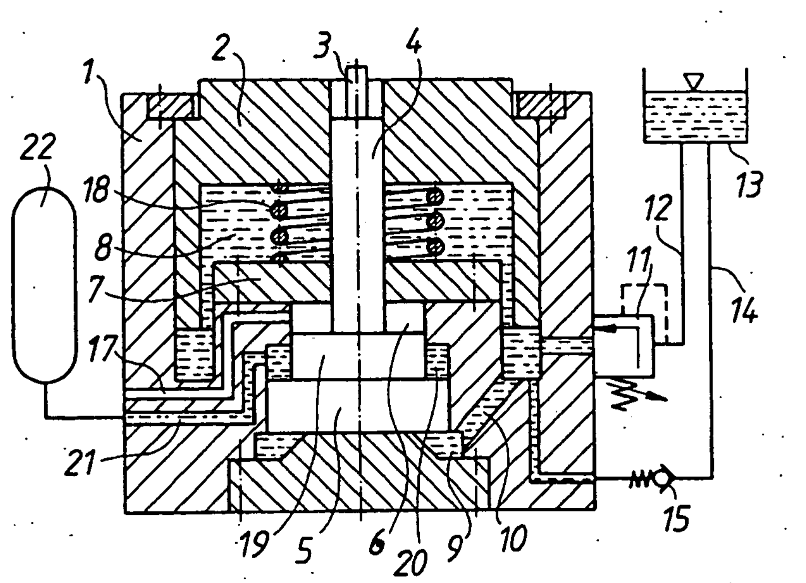


Fig. 3

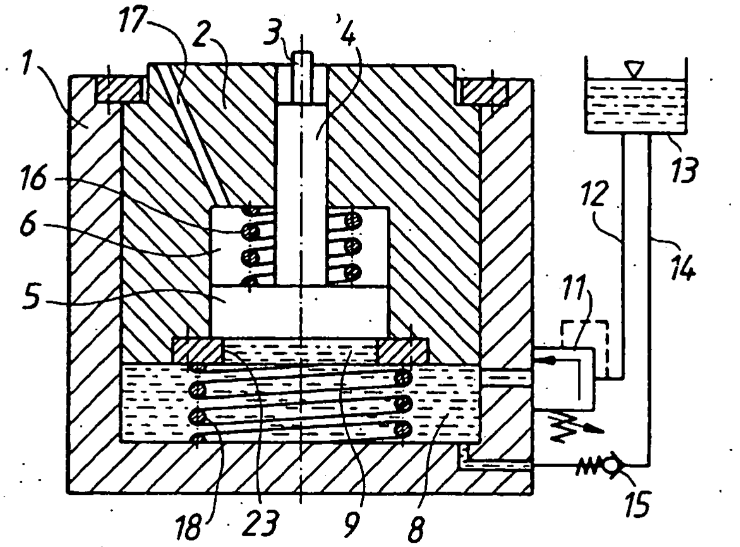


Fig. 4

PTO 04-1681

CY=DE DATE=19450116 KIND=PS
PN=750 525

RIVETING TOOL
[Nietwerkzeug]

Friedrich Wilhelm Rech

UNITED STATES PATENT AND TRADEMARK OFFICE
Washington, D.C. February 2004

Translated by: FLS, Inc.
PUBLICATION COUNTRY (19) : DE

DOCUMENT NUMBER (11) : 750525

DOCUMENT KIND	(12) :	PS
	(13) :	PUBLISHED PATENT
PUBLICATION DATE	(43) :	19450116
PUBLICATION DATE	(45) :	
APPLICATION NUMBER	(21) :	P90628 IB/49G
APPLICATION DATE:	(22) :	19440525
ADDITION TO	(61) :	730549
INTERNATIONAL CLASSIFICATION	(51) :	
DOMESTIC CLASSIFICATION	(52) :	49G 16/01
PRIORITY COUNTRY	(33) :	
PRIORITY NUMBER	(31) :	
PRIORITY DATE	(32) :	
INVENTOR	(72) :	RECH, FRIEDRICH WILHELM
APPLICANT	(71) :	
TITLE:	(54) :	RIVETING TOOL
FOREIGN TITLE	[54A]:	NIETWERKZEUG

The invention relates to a riveting tool consisting of a riveting die which is arranged equiaxed in an eyelet and rivet setter sleeve which both dip into a vacuum-tightly sealed fluid or rubber pad in accordance with Patent 730549, in the special configuration that the riveting die carries several working dies which are located eccentrically to the eyelet and rivet setter sleeve.

The practical use of the riveting tool in accordance with the above principal patent has revealed that, in some cases, it is advantageous to punch a number of rivets in one work run. Thus, in airplane engineering, for instance, it is often necessary to rivet on plate nuts, or similar, the riveting of which previously was carried out in such a way that, first, the one rivet and then the second rivet was punched. This riveting process requires accurate work, in order to guarantee the uniformly solid and tight fit of the plate nuts. The deficiencies of the previous work process become even more obvious when flanged sockets or similar items are riveted on, where six to eight rivets must be inserted individually. The riveting of the wing flaps, or similar, can also only be carried out with difficulty with the tool of the principal patent, when the process involves the riveting of rivet locations on a closed profile. This riveting frequently has to be done manually.

In comparison, the riveting tool in accordance with the invention exhibits great advantages by means of which the previous disadvantages are completely eliminated. To remain with the above example, the two rivets of the plate nuts can be riveted on in one single work run with the riveting tool in accordance with the invention, whereby the vitally

important uniformly tight fit of the plate nuts is guaranteed. With the present riveting tool, for flanged sockets or similar, which must be riveted on with six to eight rivets, the riveting of all required six or eight rivets is carried out in one single work process. The resulting advantages are obvious. Not only a substantial savings in work hours and greater ease in how the work is carried out, but, in addition, a uniformity and solidity of the fit is realized that could not otherwise be attained. The disadvantages which previously arose when riveting wing flaps are also eliminated by the riveting tool in accordance with the invention because with this riveting tool, it is possible to perfectly rivet even in riveting locations that are near a closed profile. Apart from the riveting examples provided here, the riveting tool can expediently be used in any places where several closely spaced rivets are to be punched.

The invention is represented in the drawings. These show:

In Fig. 1, the riveting tool in accordance with the invention with two riveting dies,

In Fig. 2, the riveting tool with an eccentric individual die.

Pursuant to Fig. 1, the structural engineering of the tool in accordance with the invention is such that, instead of the tool that is specified in accordance with the principal patent with a single riveting die, a tool with several dies is employed. The mechanical processes are the same here as in the riveting tool with a die in accordance with Patent 730549. In contrast, the engineering design in accordance with the invention is such that, on the head (a) of the tool, a recess (b) is provided, so that the projecting edges of the plate nuts, flanged sockets,

or similar, cannot impede the riveting process. The individual dies (c) are arranged on a plunger (d) and connected with the head piece of the plunger (d), or placed on it. The plunger (d) rests on a fluid or rubber pad (e) and is displaceably carried in the eyelet sleeve (f). The eyelet sleeve (f) is, in turn, enclosed by the pressure chamber sleeve (g).

The way in which the riveting tool in accordance with the invention works is the same as that of the riveting tool in accordance with the principal patent, with the only difference that, instead of one riveting die, several working dies are present.

In the riveting tool in accordance with the configuration example pursuant to Fig. 2, only one single die (i) is provided instead of the working dies that are eccentric in relation to the tool's axis (k). With this tool, it is possible to work on those riveting locations that are directly next to a closed profile, or similar.

Patent Claims

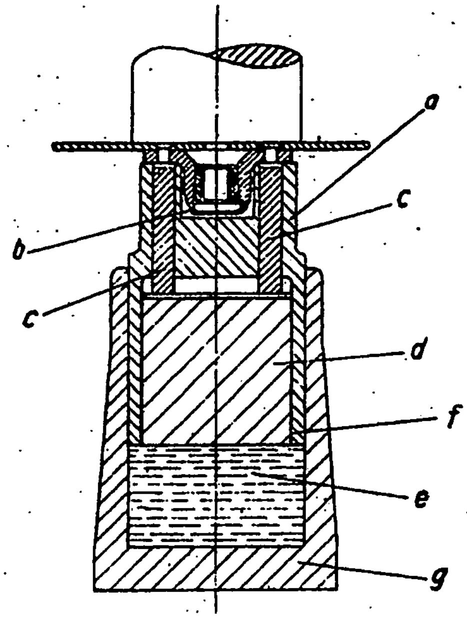
1. Riveting tool consisting of a riveting die which is arranged equiaxed in an eyelet and rivet setter sleeve which both dip into a vacuum-tightly sealed fluid or rubber pad in accordance with Patent 730549, characterized in that the riveting die (d) carries several working dies (c) which are situated eccentrically to the eyelet and rivet setter sleeve (f).

2. Riveting tool in accordance with Claim 1, characterized in that the riveting die (h) carries a working die (i) which is situated eccentrically to the part of the eyelet and rivet setter sleeve which dips into the pad.

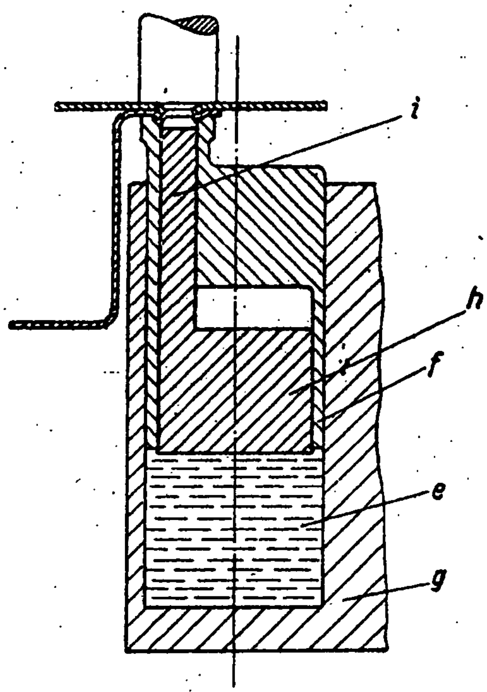
No printed publications were taken under consideration in the patent granting procedure to delimit the subject of the application from the state of the art.

Accompanied by 1 page of drawings.

[Figure 1]



[Figure 2]



PTO 04-1680

CY=DE DATE=19450111 KIND=PS
PN=730 549

RIVETING TOOL
[Nietwerkzeug]

Friedrich Wilhelm Rech

UNITED STATES PATENT AND TRADEMARK OFFICE
Washington, D.C. February 2004

Translated by: FLS, Inc.

PUBLICATION COUNTRY	(19) :	DE
DOCUMENT NUMBER	(11) :	730549
DOCUMENT KIND	(12) :	PS
	(13) :	PUBLISHED PATENT
PUBLICATION DATE	(43) :	19450111
PUBLICATION DATE	(45) :	
APPLICATION NUMBER	(21) :	F87427 IB/49G
APPLICATION DATE:	(22) :	19421217
ADDITION TO	(61) :	
INTERNATIONAL CLASSIFICATION	(51) :	
DOMESTIC CLASSIFICATION	(52) :	49G 16/01
PRIORITY COUNTRY	(33) :	
PRIORITY NUMBER	(31) :	
PRIORITY DATE	(32) :	
INVENTOR	(72) :	RECH, FRIEDRICH WILHELM
APPLICANT	(71) :	GERHARD FIESELER WERKE GMBH; GERHARD FIESELER
TITLE:	(54) :	RIVETING TOOL
FOREIGN TITLE	[54A]:	NIETWERKZEUG

The invention relates to a riveting tool consisting of a riveting die which is arranged equiaxed in an eyelet and rivet setter sleeve in the special configuration that a volumetrically sealed fluid or rubber pad is provided in which both are immersed.

Riveting tools with a riveting die which is arranged equiaxed in an eyelet and rivet setter sleeve are already known to the art. In these tools, a spring is provided between the riveting die and the eyelet sleeve which presses the eyelet sleeve on the sheet metal to be riveted when the riveting die is actuated, thus bringing about the required tight fit against the sheet metal. In another case, the eyelet sleeve is configured springy itself or spring-loaded by means of a plate spring. In both cases, only thin pieces of sheet metal can be riveted because, with sheet metal of a greater thickness, forces are required that exceed the framework of a simple spring mechanism.

In comparison, considerable progress is made by means of the inventive configuration of the riveting tool with the assistance of a vacuum-sealed liquid and rubber pad. Thus, it is now possible to impart the full riveting force on the eyelet sleeve and to, thereby, realize a perfectly tight fit against the sheet metal. Furthermore, with the inventive riveting tool, the sheet metals are pulled through before the rivet is deformed, so that they are already pulled through during the actual riveting process and are tightly pressed together with all of the riveting pressure, whereby, furthermore, an extremely effective tight fit against the sheet metal results. Moreover, a jolting pounding of the riveting shaft is prevented by means of the inventive liquid and rubber pad. Rather, it

is evenly pushed together under the influence of the liquid's pressure, whereas the rivet material fills out any hollow space between the sheet metal pieces which are laid on top of each other in steps. Due to this improved filling out of the hollow spaces, the frictional pressure in the hole is increased and the shearing surface of the riveting shaft enlarged. Moreover, opportunities for corrosion are possibly decreased.

The riveting force which must be expended for the tool is derived from a manually operated or mechanical regular pressure-, pounding-, or punching tool. When the work piece has been inserted and the rivet, e.g., a countersunk rivet, has been introduced, the force acting on the riveting tool in accordance with the invention is transmitted through the rivet itself to a riveting die. This riveting die is flexibly guided in an eyelet sleeve that surrounds it and now moves downward into the housing. A liquid or rubber pad that is located inside the housing is put under pressure by the riveting die which presses down on the same. This pressure is transmitted from the liquid or rubber pad on the eyelet sleeve which is flexibly guided in the housing which thereby moves upward in opposite direction of the riveting die and causes the inserted work piece (the sheet metal to be riveted, or similar) to deform via the underside of the countersunk rivet head. Due to the introduced force, the eyelet sleeve is now pressed downward in a reversal of the above-described process, whereby now, it, in turn, presses on the liquid or rubber pad, and the riveting die is moved upward as a result, which thereby carries out the formation of the snap head.

The inventive tool facilitates a simplification of the riveting processes, particularly, in the producing of the pulled-through rivet. Above all, it reduces the previously required work processes of pulling through and tightening. Moreover, a riveting improvement is realized because riveting occurs in a tight fit with the sheet metal and the intermediate spaces between the edges of the holes which are laid on top of each other in steps are filled out with rivet material.

The invention is represented in the drawings, and, more specifically, the following is shown:

Figure 1, the tool in a schematic section,

Figure 2, the tool in a section while the pieces of sheet metal are being penetrated,

Figure 3, the tool while the riveting shaft is compressed.

To retain the liquid or rubber pad, a retaining space (c) is provided inside a housing (a). An eyelet sleeve (d) which is guided from the housing (a), in which a riveting die (e) is arranged that is also carried flexibly, protrudes into this space (c). The force of a pressure-, pounding-, or punching tool plunger (f) acts upon the tool. The volumetric size of the retainer space (c) can be changed slightly as required for the adjustment of the tool by means of an adjusting screw (g) or similar.

The way in which the inventive riveting tool works is described below:

Upon insertion of the work piece (h) (pieces of sheet metal to be riveted together, or similar) and introduction of the countersunk rivet (i), the force that is generated by the plunger (f) is transmitted to the riveting die (e). The riveting die (e) is thereby moved in downward

direction into the hollow space (c) of the housing. Its bottom end which meets the liquid or rubber pad (b) displaces the same according to the riveting die volume that is dipped into it, whereby the pad (b) lifts up the eyelet sleeve (d) by an amount which corresponds with this volume. The effect which is thereby brought about is that the eyelet sleeve (d) comes to lay against the work piece (h) and deforms it in the pull-down process via the bottom side of the rivet head of the countersunk rivet (i) (see Fig. 2). The force that is further introduced by the die (f) causes a reversal of the above-described process. Now, the eyelet sleeve (d) is driven down into the pad (b) again, while, at the same time, the riveting die (e) is moved upward against the riveting shaft of the rivet (i) due to its volumetric displacement, and carries out the formation of the rivet's snap head (see Fig. 3).

The bottom surfaces of the riveting die (e) and the eyelet sleeve (d) are in an appropriate relation to one another. Easily replaceable rivet inserts are provided for various rivet diameters.

With the inventive riveting tool, which, naturally, can also be of configurations that are different from the one shown, any riveting processes arising in sheet metal processing can be carried out with a totally tight fit against the sheet metal, such as truss head riveting, flatsunk riveting, and mushroom riveting.

Patent Claims

1. Riveting tool consisting of a riveting die which is arranged equiaxed in an eyelet and rivet setter sleeve, characterized by the

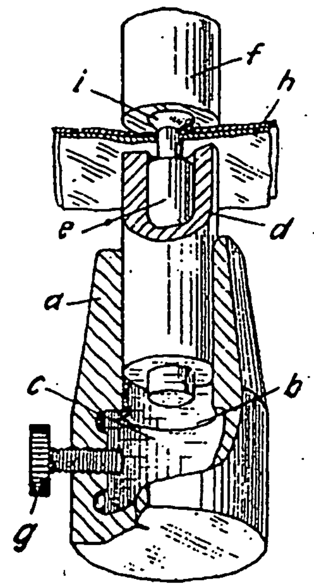
providing of a volumetrically sealed fluid or rubber pad (b) in which both the riveting die (e) and the sleeve (d) are immersed.

2. Riveting tool in accordance with Claim 1, characterized in that both the both the riveting die (e) and the sleeve (d) are exchangeable and dip into the liquid or rubber pad (b) with surfaces that are matched to the working conditions.

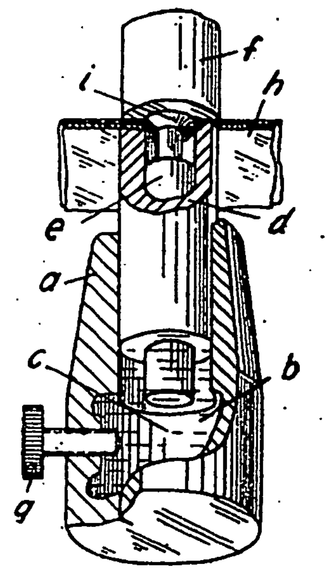
3. Riveting tool in accordance with Claims 1 and 2, characterized in that a volume-displacing adjusting mechanism, e.g., an adjusting screw (g), or similar, protrudes into the liquid or rubber pad (b).

Accompanied by 1 page of drawings

[Figure 1]



[Figure 2]



[Figure 3]